

SPHAEROCERID FLIES FROM SOUTH AND CENTRAL
AMERICA IN THE COLLECTION OF THE
CALIFORNIA ACADEMY OF
SCIENCES

(Diptera)

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On a recent visit to the Department of Entomology and Parasitology, University of California, Berkeley, I was able, owing to the kind cooperation of Dr. E. S. Ross and Dr. P. H. Arnaud, to examine the flies of the family Sphaeroceridae in the collection of the California Academy of Sciences. The species from South and Central American are dealt with here but it was not possible to determine all the species of the genus *Leptocera* Olivier. The types of all the new species (except one indicated below) are in the collection of the Academy. I am indebted to Mr. Curtis W. Sabrosky for help in examining certain types in the U.S. National Museum. The photographs of wings were kindly made by Mr. J. W. Siddorn. The nomenclature of the male genitalia is that of Richards (1961).

Genus ARCHIBORBORUS Duda, 1921

ARCHIBORBORUS (ARCHIBORBORUS) HIRTIPES (Macquart, 1843)

The commonest South American species. Chile, Arauco: Angol, 13.IX.50, 1 ♀ (R. Gomez), 23.XII.50-1.I.51, 16 ♂, 24 ♀ (E. S. Ross and A. E. Michelbacher).

ARCHIBORBORUS (PROCOPROMYZA) SIMPLICIMANUS Richards, 1931

Known from Chile and Argentina. Chile, Nuble: 40 km east of San Carlos, 23.VII.50, ♂ ♀ (E. S. Ross and A. E. Michelbacher).

ARCHIBORBORUS (PROCOPROMYZA) SUBMACULATUS Duda, 1921

The species is so far known only from Chile and is sometimes a little short-winged. Chile, Arauco: Angol, 1.I.51, ♂ (E. S. Ross and A. E. Michelbacher).

ARCHIBORBORUS (PROCOPROMYZA) EDWARDSI Richards, 1931

This species was described from a single male captured at Chile, Llanquihue: Puerto Montt. The female first recorded below has been compared with the male type and seems to belong to the same species. Chile, Cautin: 22 km. east of Temuco, VI-VII.51, ♀ (M. G. Smith); Osorno, 30 km. east of Purranque, 15.I.51, ♀ (E. S. Ross and A. E. Michelbacher).

ARCHIBORBORUS (PROCOPROMYZA) CHILENSIS Richards, 1931

Previously recorded from Chile and Argentina. Chile, Bio-Bio: El Albanico, 31.XII.59 2 ♂ (E. S. Ross and A. E. Michelbacher).

Archiborborus (Procopromyza) annulatus

Richards, new species

Male and female.—Shining blackish-brown; face, front third of frons, buccae, part of second and third antennal segments, reddish-yellow; stripes through the dorso-centrals and thoracic sutures more or less brown; fore coxae, broad apical ring on all femora, yellowish brown, tibiae and tarsi rather darker, tibiae with indications of two darker rings. Halteres yellowish, base of knob darker. Wings (fig. 1) dark brown with five hyaline spots on R_{4+5} ; the two cross-veins and the veins in the spots white, otherwise dark brown. Length about 4.0 mm, wing 3.75 mm.

Structure as in *A. albicans* Richards (1931:68) except in the following particulars: buccae rather narrower, only one quarter as wide as vertical height of eye; acrostichals in six rows; fifth sternite elongate, narrowed to apex which is not very deeply emarginate, emargination defined by weakly pointed lobes, lobes and emargination with whitish edges; hook at apex of fore basitarsus very small; mid tibia with anterior bristle at $\frac{2}{3}$, three dorsals and a mid ventral, and a preapical ring of 4-5 bristles; hind femur with only three anterodorsal bristles.

Holotype male, allotype female: CHILE, NUBLE, 40 KM EAST OF SAN CARLOS, 23.XII.50 (E. S. Ross and A. E. Michelbacher).

In my key to the species (1961:57) runs to *A. submaculatus* Duda (couplet 14) but differs in the more narrowed fifth sternite of the male and in the pale femoral rings. Only one other species of the subgenus, *A. chaetosus* Richards, has maculated legs but this has greatly reduced wings and long bristles on the abdomen.

Genus FRUTILLARIA Richards, 1961**FRUTILLARIA species**

I described this genus with five species from Chile in 1961 (loc. cit.:63). It is not possible so far to distinguish the females. Drs. E. S. Ross and A. E. Michelbacher captured one female at Chile, Cautin: 20 km. east of Temuco, 8.I.51. This is approximately 38° S. while previously the most northerly locality for the genus was 41° S.

Genus CEROPTERA Macquart, 1835**Ceroptera venozolana Richards, new species**

The present species seems in structure to be an outlying member of the genus *Ceroptera* Meigen though if it does not prove, like the others, to be associated with scarabaeid beetles it will probably be better to place it in a new separate genus. Though generally resembling a *Leptocera* Olivier, the spur on the hind tibia and to a less extent the wing-venation shows affinities to *Copromyza* Fall. The numerous spines on the hind tibia are unique in the family and the scutellar bristles are unusual.

Male and female.—Blackish-brown with whitish bloom, sides of meso-

scutum paler, lower half of pleura and base of legs, yellowish-brown. Abdomen reddish-brown, segments with whitish margins in female. Halteres very pale. Wings greyish-white, veins not darker. Length about 2.0 mm.

Head bristles as in *Leptocera* Olivier (but ♂ with three outwardly directed superior orbitals on left side only), four pairs of interfrontals (three large but not cruciate), head clearly wider than long, frontal knob distinct but not very large, facial keel moderately strong, without bristles; first antennal segment with quite strong forwardly directed bristle, antennae strongly diverging, third segment with white pubescence, arista subapical, three times as long as antenna, with moderately long pubescence; head not at all higher than usual, buccae at narrowest about two-fifths greatest diameter of eye, largest buccal bristle about one-third as long as vibrissa. Humeri with two long bristles, one pair of long posterior dorsocentrals, one much shorter

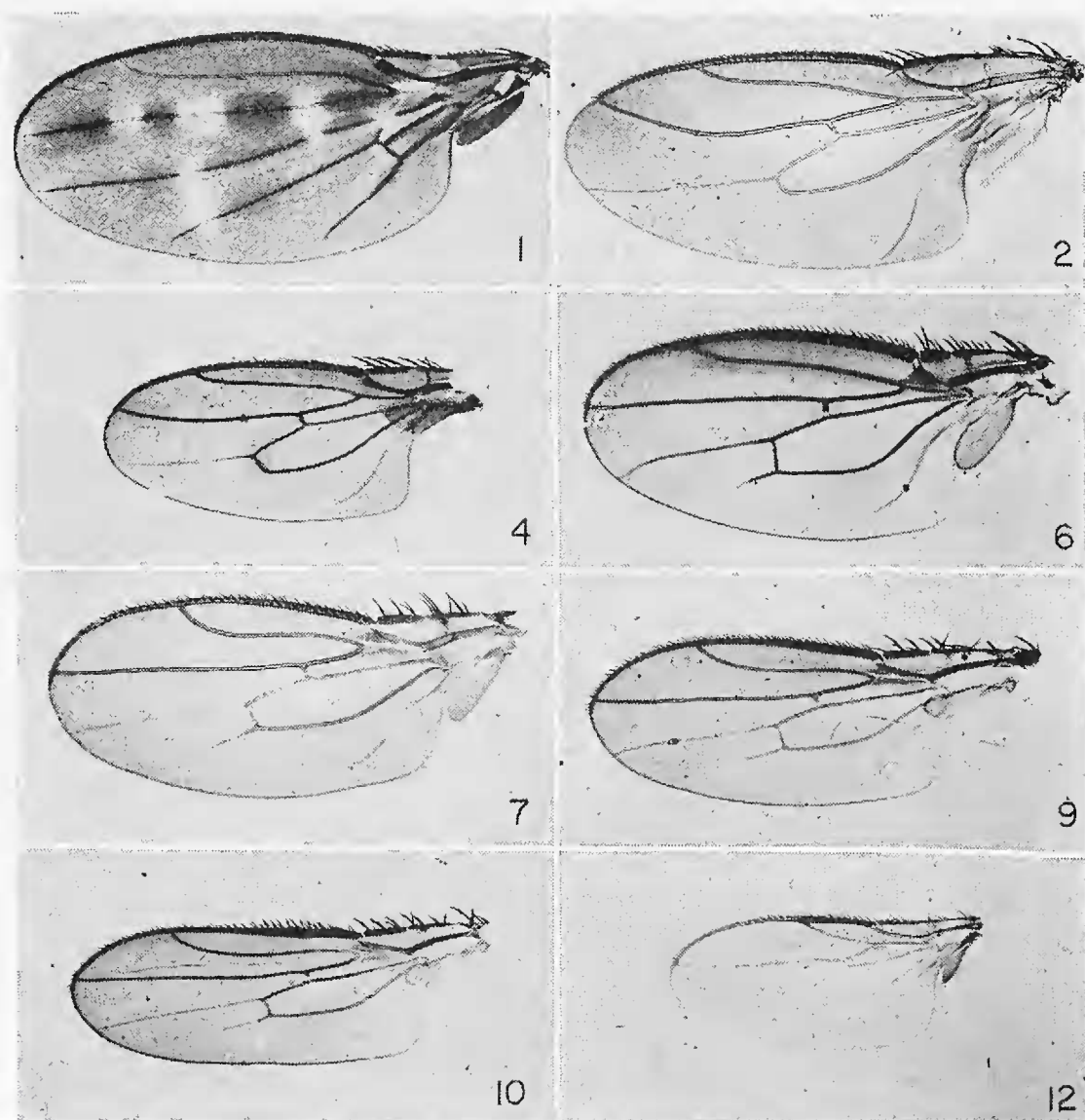


Fig. 1, left wing of *Archiborborus annulatus* Richards. Fig. 2, left wing of *Leptocera schlingeri* Richards. Fig. 4, left wing of *Leptocera rossi* Richards. Fig. 6, left wing of *Leptocera arnaudi* Richards. Fig. 7, left wing of *Leptocera dolichoptera* Richards, male. Fig. 9, left wing of *Leptocera phyco-phila* Richards, male. Fig. 10, the same, left wing of female. Fig. 12, left wing of *Leptocera mollis* Richards, female.

pair in front and, just on suture, another pair hardly distinguishable from microchaetes, about six rows of acrostichals, scutellum elongate with four long bristles, one additional short one in front of basal and two additional short ones between basals and apicals on each side. Sternopleuron with one bristle and two or three minute setae. Legs with tarsi quite unmodified, pretarsus and claws not enlarged, fore legs with no bristles except usual dorsal and ventral rows on the femur; mid trochanter with no enlarged bristle, mid femur with four downwardly directed anterodorsals on distal half, mid tibia with three dorsal pairs of short stout bristles at $\frac{1}{4}$, $\frac{1}{2}$, $\frac{5}{6}$; an anterior at $\frac{2}{3}$ and before the apex, a mid ventral and a very short apical ventral; mid basitarsus rather more than half as long as tibia with no enlarged setae; hind femur with two anterior bristles before apex, hind tibia with about seven bristles on dorsal surface, some more or less paired, a short, somewhat anterior ventral apical curved spur; tarsi normal, second segment clearly longer than first; male with longer and denser hairs on legs than female, with group of about three rows of seven bristles on the underside of the mid femur on the proximal quarter, distal quarter of mid tibia with some black ventral setae, hind tibia with thirteen bristles on dorsal side. Wings long and narrow with a narrow alula, veins little darkened, first sector of costa with longish bristles, second sector more than twice as long as the third, R_{4+5} almost straight, very little bent forwards, not overpassed by costa, intermedian cell very long and narrow, M_{1+2} extending as a fold almost to margin, other corner of cell almost rounded, anal vein (fold) gently concave forwards. Abdomen short and very bristly, male fifth tergite with long bristles, almost forming a brush on the left, overhanging the genitalia, sternites also very bristly, some of the bristles short, dense and outstanding; genitalia large, anal slit short oval, directed downwards, surrounded by short bristles, other details concealed. ♀ cerci orange-brown, retracted, each with a short, stout, inwardly-curved, black, hook-like bristle.

Holotype male, allotype female; VENEZUELA: GUANACE, ESTADO PORTUGUESA 10-13.IX.57 (B. Malkin).

Differs from all described species of the genus in having stout spines on the hind tibia.

Genus LEPTOCERA Olivier, 1913

LEPTOCERA (LEPTOCERA) NEOCURVINERVIS Richards, 1931

Previously recorded from Chile and Argentina. Chile: Talca, 22 mi. north of Talca, 22.XII.50, ♂; Nuble, 40 km east of San Carlos, 23.XII.50, 2♂ 1♀; Arauca, Angol, 1.I.51, ♂ ♀; Arauca, Sierra Nahuelbuta west of Angol, 1200 m, 3.I.51, ♂ (E. S. Ross and A. E. Michelbacher).

LEPTOCERA (LEPTOCERA) ABDOMINISETA Duda, 1925

The species is widespread in South America and also recorded from Hawaii and Tristan da Cunha. Peru: Callao, 17.XII.50, 17♂ 9♀ (E. S. Ross and A. E. Michelbacher).

LEPTOCERA (LEPTOCERA) FULVA (Malloch, 1912)

This species is widespread in Central and South America. Peru: Pualba, 2.X.54, ♀. Ecuador, Napo-Pastaza: 2-8 miles north of Puyo, 953 m, 9.II.55,

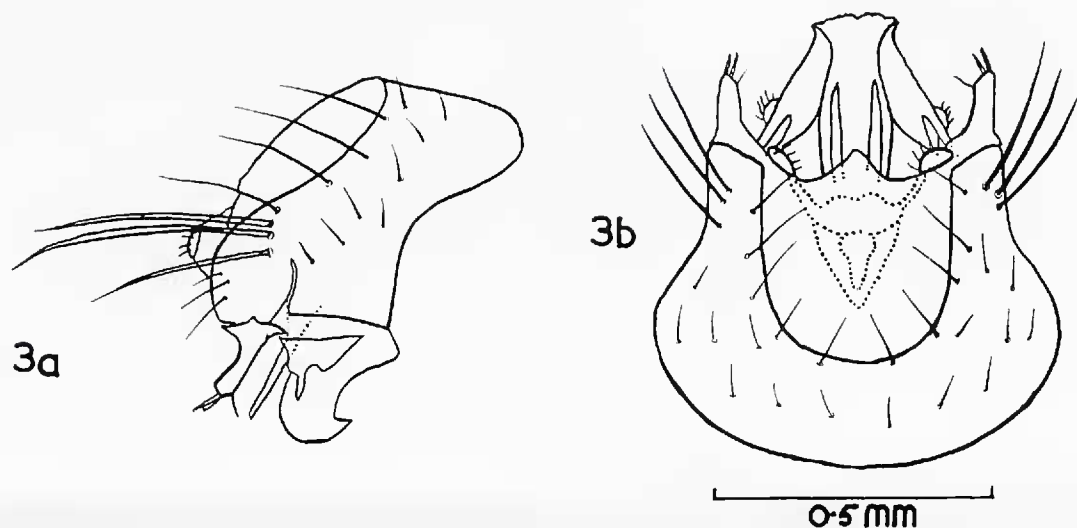
11 ♂ 6 ♀. Columbia, Cauca: 27 miles south of Popoaya, 1750 m, 5.III.55, ♂ 2 ♀; Valle: 40 miles south of Cali, 1140 m, 6.III.55, ♀ (all E. I. Schlinger and E. S. Ross).

Leptocera (Leptocera) schlingeri

Richards, new species

Male and female.—Velvety black, dull; extreme front of frons, antennae, much of face, buccae, palpi, reddish brown. Larger bristles arising from somewhat greyish spots. Notopleural region and base of wing, pale yellow. Stripe across top of sternopleuron pale reddish-brown. Legs reddish-brown, coxae and trochanters paler. Halteres yellowish-brown. Wings grey. Length 2.6-4.0 mm.

Head with longest buccal bristle not more than $\frac{1}{4}$ as long as the vibrissa. Three pairs of interfrontal bristles, front pair much longer and directed more forwards, other head bristles normal. Arista nearly five times as long as antenna, with long pubescence. Thorax with one very long and one short humeral bristle, three pairs of strong dorsocentrals, acrostichals very little enlarged but their length somewhat variable, not separated by a row of microchaetes, with about three rows of microchaetes on each side between them and dorsocentrals; scutellum with usual 8 bristles but one female has an extra basal bristle on each side; sternopleuron with one very strong and one weak bristle. Fore legs unmodified. Midlegs with bristle on trochanter distinct but not very long; femur with only the preapical anterior bristle; tibia with 3 anterodorsal and two posterodorsal bristles on basal quarter, the lowest anterodorsal being large, two long nearly paired bristles at $\frac{4}{5}$ and a small posterior; at a slightly higher level a small anterodorsal, a mid ventral and a preapical ventral; basitarsus with a long ventral at $\frac{1}{4}$. Hind legs unmodified, second tarsal segment nearly twice as long as first. Wings (fig. 2) with bristles on first costal sector practically not enlarged, second costal sector more than twice as long as third, R_{2+3} considerably sinuate, joining costal at a moderate angle, R_{4+5} strongly bent forwards, ending far in



EXPLANATION OF FIGURES

Fig. 3, *Leptocera schlingeri* Richards: a, male genitalia from the right; b, male genitalia in true dorsal (apparent ventral) view.

front of wing-tip, M_{2+3} produced beyond cell as a straight fold to margin, posterior angle of cell almost rounded. Abdomen in male with segment 1+2 much longer than 3, 4, or 5 which are short but of gradually increasing length; no long lateral bristles but tergite 5 with one very long curved bristle on each side; genitalia small and retracted, sternite 5 emarginate at apex, a small lobe bearing three short black spike-like bristles on each side of emargination. In a macerated specimen, genital forceps small, with one bristle and two spikes at apex; gonapophyses close together, spike-like; aedeagus defined by lateral plates which in side view are hooked below and dorsally bear a finger shaped process and a small lobe bearing short bristles. Anal split not closed, bearing long bristles. Abdomen in female with tergites 3-6 each a little longer than its predecessor, 4-6 with a moderate lateral bristle on each side, cerci fused into a single plate bearing a pair of short, down-curved pale bristles; sternites with short bristles.

Holotype male and allotype female: ECUADOR, NAPO-PASTAZA: 6-8 MILES WEST OF MERA, 1500 m, 10.II.55, and 2♂ 6♀ paratypes, same data (E. I. Schlinger and E. S. Ross).

The colour of this species is distinctive and the short bristles of the first costal sector are very unusual in this subgenus. In Duda's key to his subgenus *Paracollinella* (= *Leptocera Leptocera*, 1925: 15) it runs to couplet 43. None of the three species there (*L. abdominiseta* Duda, *L. fulva* Duda and *L. parafulva* Duda) has a velvety black, yellow-edged mesoscutum or short bristles on the first costal sector. None of the other more recently described species seems to be at all similar. The enlarged pair of frontal bristles is quite unusual.

LEPTOCERA (RACHISPODA) BIPILOSA Duda, 1925

The species was described from Bolivia. Columbia, Cundinamarca: 12 miles southeast of Bogota, 2930 m, 13.III.55, ♂; Meta: 3 miles west of Villavicencio, 920 m, 11.III.55, 19♂ 9♀; Narino: 32 miles north of Pasto, 4. III.55, 2♀; Valle: 40 miles south of Cali, 1140 m, 6.III.55, 42♂ 34♀; 17 miles west of Sevilla, 7.III.55, 28♂, 23♀ (all E. I. Schlinger and E. S. Ross).

LEPTOCERA (RACHISPODA) AEQUIPILOSA Duda, 1925

The species is widespread in South America but has not before been recorded from so far north. Peru: Pucalba, 2.X.54, 2♀. Columbia, Valle: 40 miles south of Cali, 6.III.55, ♀; 17 miles west of Sevilla, 7.III.55, ♂ 3♀ (all E. I. Schlinger and E. S. Ross).

LEPTOCERA (RACHISPODA) STRIATA Duda, 1925

The species is recorded from Chile and Argentina. Chile, Coquimbo: 50 km. south of La Serena, 1.XII.50, 3♀, 20 km. southwest of Ovalle, 12.XII.50, ♀; Aconcagua: 10 km east of Papudo, 27.XI.50, 2♂; Nuble: 40 km east of San Carlos, 23.XII.50, 3♂; Bio-Bio: El Albanico, 31.XII.50, 1♂ 2♀ (all E. S. Ross and A. E. Michelbacher).

LEPTOCERA (RACHISPODA) LIMBINERVIS Duda, 1925

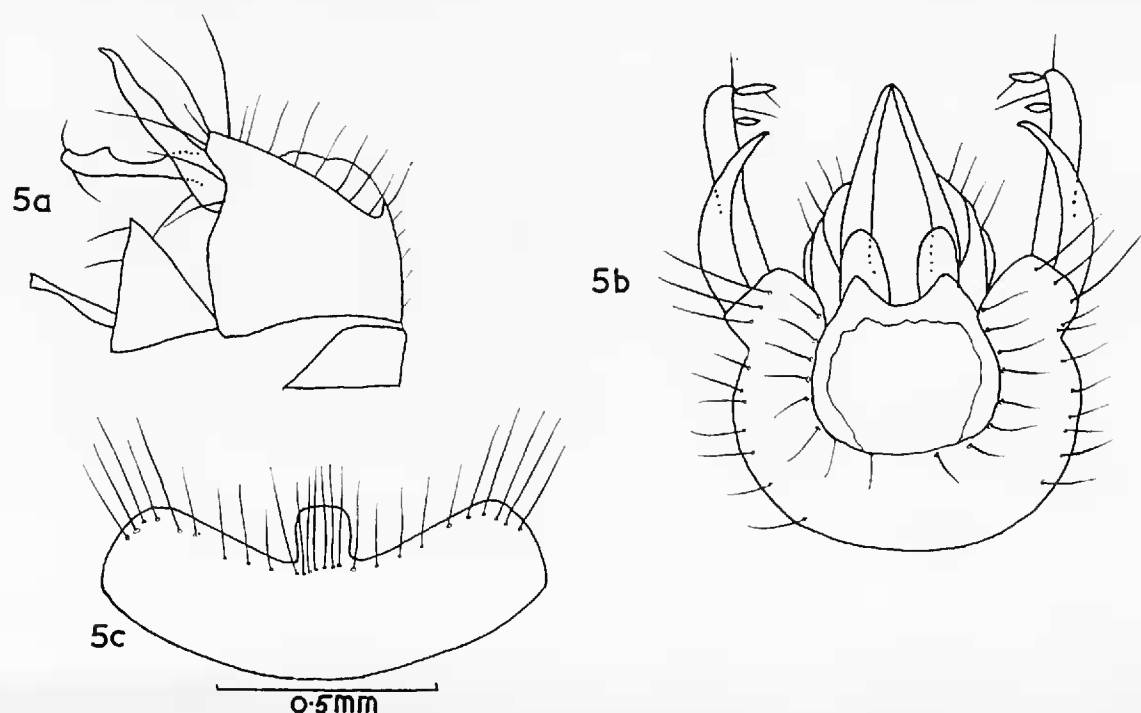
The species was described from Costa Rica. Mexico, Nuevo Leon: 20

miles west of Linares, 8.XI.46, 2 ♀; Colima: southeast slope of Mt. Colima, pine zone, XII.48, ♂ 6 ♀; San Luis Potosi: 5 miles north of Tamazunchale, 22.XII.48, ♂ (all E. S. Ross).

***Leptocera (Rachispoda) rossi* Richards, new species**

Male and female.—Black, somewhat brown dusted, but mesoscutum rather shining; scutellum, pleura and dorsal side of abdomen dull. Halteres pale reddish. Wings moderately infuscate. Length 2.0-3.0 mm.

Head on each side with one vibrissa and one almost equally long up-turned buccal bristle. Facial knob only moderately prominent but genae well-developed in front of eyes. Arista two and a half times as long as antenna, with moderate pubescence. Two long and 2-3 short interfrontal bristles on each side. Two or three pairs of slightly enlarged acrostichal bristles with two rows of microchaetes between them. Five pairs of dorsocentral bristles, counting the incurved scapulars. Scutellum with 8 marginal bristles, first pair very small, second and fourth very long, third moderate and a little more discal; disk with one pair of moderate bristles behind middle and in all about two dozen other minute bristles scattered on each side of mid line. One long and one moderate sternopleural bristle. Legs with normal bristles for this sub-genus, no special bristles in male; mid tibia with long dorsal bristle, surmounted by smaller one, at $\frac{1}{3}$, three long bristles at $\frac{3}{4}$ surmounted by two smaller ones, a mid ventral and a preapical ventral; hind tibia externally with complete row of oblique bristles not quite as long as its diameter; bristles of hind trochanter not modified, second segment of hind tarsus nearly twice as long as first. Wings (fig. 4) with first costal sector with long bristles, second sector more than twice as long as the third, R_{4+5} moderately curved forward, not strongly divergent from M_{1+2} , posterior outer corner of cell weakly angular, sometimes almost rounded. Abdomen



EXPLANATION OF FIGURES

Fig. 5, *Leptocera rossi* Richards: a, male genitalia from the right; b, male genitalia in true dorsal (apparent ventral) view; c, sternite five, ventral view.

with plates 1+2, 3, 4 and 5 of about the same length but 1+2 rather longer, especially in ♀; genitalia (figs. 5a, 5b) somewhat large; anal split widening a little downwards and not closed below, bearing short, close bristles, becoming somewhat longer and denser below; in the unmacerated genitalia a shining dark brown inwardly-directed curved hook can be seen on each side; beyond this another dark brown, shining, downwardly directed, feebly curved process of which the end bears a short, stout, spike-like bristle; a narrow spike-like process protrudes from the aedeagus; fifth sternite (fig. 12b) with long marginal bristles becoming denser at mid-line where there is a tongue-shaped, downwardly bent projection. Female with end of abdomen protruding as a short cone, cerci with one pair of longish curved hairs and some shorter ones.

Holotype male and allotype female: CHILE, CAUTIN: 20 KM EAST OF TEMUCO, 7.I.51, and 15♂ 20♀; Arauca: Angol, 1.I.51, 2♀ paratypes (all E. S. Ross and A. E. Michelbacher).

In Duda's key (1925:15) to subgenus *Rachispoda* (= *his Collinella*) it runs to *L. octisetoca* (Becker) from Egypt which has not yet been adequately described. Duda's redescription (1938: 81) does not mention the two pairs of large acrostichals and there are said to be 8-10 small bristles on the scutellar disk (not about 40). *L. quadriseta* (Duda, 1938:81) which has the four acrostichals has a bare scutellar disk. Probably *L. rossi* is nearest to *L. downesi* Richards, 1944 (imported into England, probably from Argentina) but in the new species the disk of the scutellum has more bristles, the acrostichals are separated by two, not one row of macrochaetes, and R_{4+5} is rather more bent.

LEPTOCERA (POECILOSOMELLA) ANGULATA (Thomson, 1868)

Distribution: Southern U.S.A., Central and South America, Caribbean, Hawaii. Peru: Monson Valley, Tingo Maria, 9-10.X.54, 5♂ 12♀ (E. S. Ross and A. E. Michelbacher). Florida: Bradensville, March, 2♂ 1♀; Jacksonville, 31.III.19, 5♂ (M. C. Van Duzee).

LEPTOCERA (CHAETOPODELLA) MELANOGASTER (Thomson, 1868) (= *Leptocera pulchripes* Duda, 1925)

The species is widespread in southern South America. Chile: Coquimbo, 3 miles north of Los Vilos, 13.XII.50, ♂; Arauca, Angol, 1.I.51, ♂ (E. S. Ross and A. E. Michelbacher).

LEPTOCERA (THORACOAETA) JOHNSONI SPULER, 1925

Spuler described *L. johnsoni* (1925: 121, fig. 2) from seaweed in several places in the state of Washington, U.S.A. He stated that the second costal sector is about the same length as the third. I have now examined a long series of his specimens including the now headless type ♀ from Seattle in the Melander collection in the U.S. National Museum and also one paratype from Seattle in

the collection of the California Academy of Sciences. The males agree with his description but in the females the second costal sector, though somewhat variable, is nearer one and a half times as long as the third, as I stated earlier (1931:78) for specimens from Ancud, Chile, and as holds for other specimens seen (1961:63) from Navarina Island, Chile.

Mexico, Baja California: San Bartolome (on coast), 12.III.53, ♂ 15 ♀ (P. H. Arnaud, C.A.S.). Chile, Santiago: El Tabo, on seaweed, 12.V.61, 18 ♂ 10 ♀ (G. Kuschel, coll. O.W.R.).

Leptocera (Thoracochaeta) arnaudi Richards, new species

Male and female.—Dull brownish-black with mesoscutum and abdominal tergites grey dusted; face, antennae, pleura (especially sutures), legs, brown to pale brown. Abdominal tergites with pale posterior segmental margins. Halteres pale with knob darker. Wings greyish. Length 2.5-3.0 mm.

Head without a facial knob; three pairs of interfrontal bristles, front pair small; antenna as usual in this subgenus with a distinct forwardly directed bristle on segment 1, arista nearly twice as long as antenna with short pubescence; eyes of nearly normal size, buccae at narrowest two-fifths as long as maximum eye-diameter. Thorax with two humeral bristles, four pairs of dorso-centrals, three front pairs directed obliquely inwards, about eight rows of acrostichals, scutellum about semi-circular, the four bristles rather short, apical pair about as long as scutellum; propleuron with two small bristles, sternopleuron with one bristle and two minute setae. Legs somewhat stout; fore legs with normal bristles, tibia dorsally with rather dense, short, oblique hairs, especially in male; mid femur with normal bristles, in male with complete row of short oblique antero-ventrals; mid tibia with four pairs of dorsal bristles, a midventral and an apical; mid basitarsus with short stout setulae; hind tibia without bristles, with 2-3 rows of short oblique setulae (considerably shorter than diameter of tibia). Wings (fig. 6) not specially elongate, alula moderately broad, costa without long bristles except a basal pair and a longish group on the first sector (4 ventral, 3 dorsal), second sector about twice as long as third, R_{2+3} gently curving and nearly parallel to costa, bending gradually toward it at the end, R_{4+5} straight, not overpassed by the costa, intermedian cell rather wide, M_{1+2} produced to costa, M_{3+4} also extending some way beyond *im*. Abdomen ovate, flattened above in ♀ with all bristles, including lateral ones short and not dense, cerci very long triangular, outer side dull, inner edge shining and reddish, outer edge with two short bristles, apex with stout reddish spike-like bristle, sternites with short bristles; ♂ with dense and moderately long bristles at side of each tergite after first, genitalia small, anal split directed obliquely downwards, surrounded by short, dense, rather woolly hairs; sternites with short bristles, fifth sternite with an apical row of somewhat longer bristles and in centre of posterior margin four short, black, backwardly-directed, stout bristles.

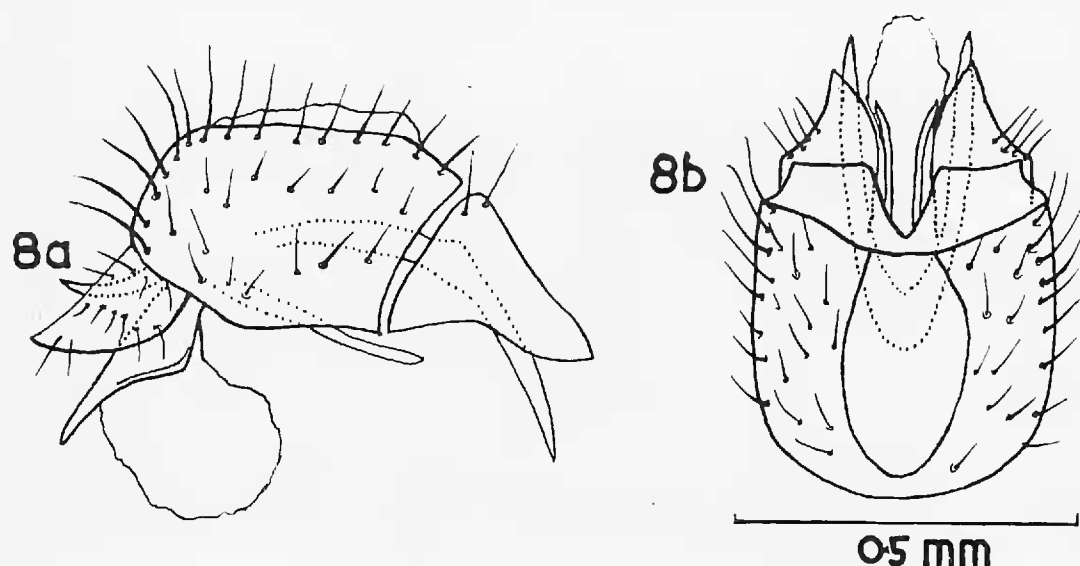
Holotype male, allotype female, 27 ♂ 20 ♀ paratypes, MEXICO, BAJA CALIFORNIA: SAN BARTOLOME, 12.III.53 (P. H. Arnaud).

In my key (1931:77), it would run to *L. johnsoni* Spuler but the second costal sector is twice as long as the third, the costa has not outstanding bristles in the female, and the size is considerably larger.

***Leptocera (Limosina) dolichoptera* Richards, new species**

Male and female.—Dull black; antennae and front of head reddish-brown. Thoracic sutures and legs pale brown to yellowish, hind legs darker. Halteres yellowish. Head, mesoscutum and abdomen somewhat greyish dusted, margins of abdominal tergites whitish, especially in ♀. Wings grey. Length without wings about 2.0 mm, ♂ a little smaller.

Facial knob moderately projecting, rather wide; antennae somewhat divergent; face obtusely keeled. Antenna with a distinct forwardly directed bristle on the first segment, a strong ring of bristles round the apex of the second segment, arista rather more than twice as long as the antenna, with moderate pubescence. Eyes rather small; narrowest part of buccae two-fifths the vertical height of eye; vibrissa stout; buccal bristle behind it equally stout and nearly as long, followed by a bristle half as long; one bristle half as long on mouth edge, close to vibrissa, and behind this a regular fringe of hair-like bristles. Four pairs of moderately long interfrontal bristles, outside them at most one or two minute setae. A pair of diverging bristles between the posterior ocelli, behind the ocellars and half as long, other head bristles normal. Mesoscutum with two divergent humeral bristles on each side, three pairs of dorsocentrals, anterior pair well in front of suture and more than half as long as prescutellar pair, acrostichals rather strong, six rows between dorsocentrals, two central rows slightly enlarged and rather widely spaced; four long scutellars, two minute propleurals, two sternopleurals, both quite large. Fore legs normal, bristles on femur rather stout and prominent, on tibia somewhat dense. Mid legs with a short bristle on the trochanter, base of femur in ♂ with a dense group of short stout



EXPLANATION OF FIGURES

Fig. 8, *Leptocera dolichoptera* Richards: a, male genitalia from the right; b, male genitalia in true dorsal (apparent ventral) view.

bristles beneath basal quarter, ventral bristles fine and evenly spaced in ♀, mid tibia with a moderate posterodorsal surmounted by a smaller anterodorsal at $\frac{1}{4}$, a moderate anterodorsal at $\frac{1}{2}$ and a pair of almost equally long strong bristles at $\frac{3}{4}$, in ♂ with no mid ventral; tibia somewhat curved with short comb-like bristles on distal half beneath, apicoventral short, anterior apical very short, in ♀ a strong mid ventral and long apicoventral, no comb-like bristles, anterior apical bristle half as long as width of tibia. Mid basitarsus rather more than half as long as tibia, relatively longer in ♀, with coarser not very numerous setulae beneath, one ventral at proximal $\frac{1}{5}$ distinctly enlarged. Hind tibia with small anterior apical bristle, basitarsus with distinct apical bristle, second tarsal segment one and a half times as long as first. Wings (fig. 7, ♂) rather elongate but considerably more so in ♀ (cf. figs. 9 & 10) with a narrow alula, bristles on first costal sector rather strong, one bristle on humeral cross-vein at some distance from costa, second costal sector about twice as long as third, costa extending to rather beyond R_{4+5} , R_{2+3} distinctly sinuate, R_{4+5} straight, M_{1+2} produced to margin, M_{3+4} extending nearly halfway to margin, cell rather narrow. Male abdomen with first four segments of about same length, bristles short, even at sides of tergites 4-5 not much longer than tergites, genitalia swollen and elongate in dorso-ventral direction, anal split twice as long as wide, fringed by short bristles, below the split genitalia (figs. 8a, 8b) forming two broad lips with short bristles between which two adjacent short brown spikes sometimes protrude, below these two short triangular brown processes; sternites little modified, not much projecting, with rather short bristles. Female abdomen with tergites 2-5 progressively a little shorter, no bristles long, end of abdomen somewhat troughlike with two long cerci lying in the trough, each cercus with two very long sinuous bristles.

Holotype male and allotype female: PERU, LIMA: N.W. CARNETO, AT SEA LEVEL (? on actual coast), 13.IX.54, and 7♂ 2♀, same data (E. I. Schlinger and E. S. Ross).

Some paratypes are now in my collection. The affinities of this species are discussed below.

***Leptocera (Limosina) phycophila* Richards, new species**

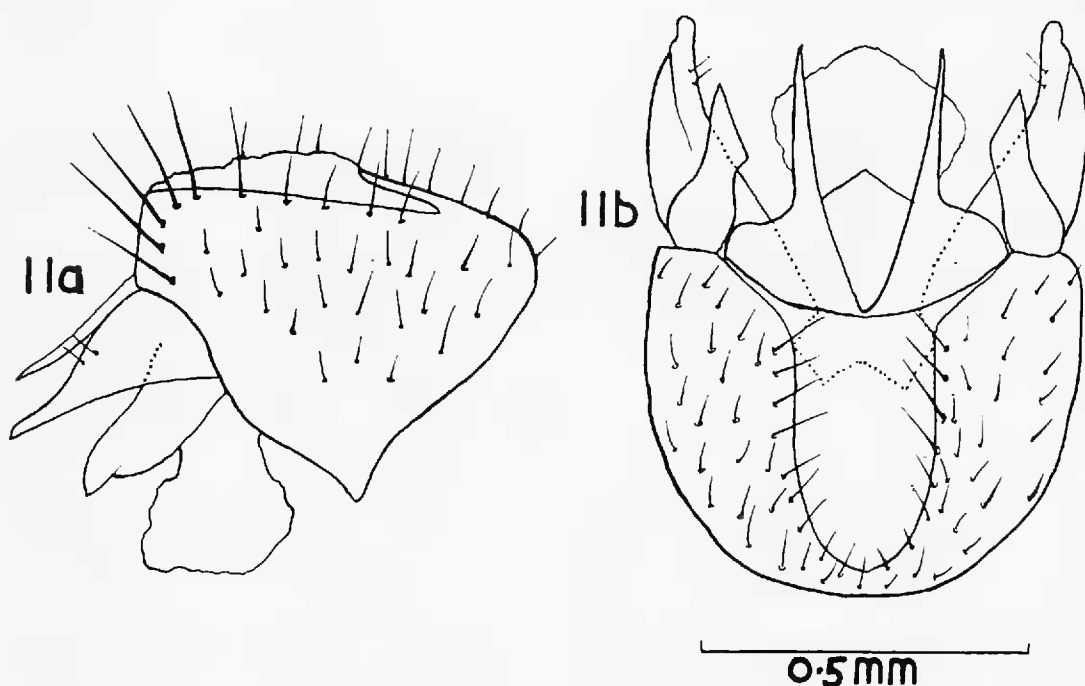
Male and female.—Dull black; third antennal segment brown. Thoracic sutures, leg-joints and tarsi pale to darker brown. Halteres pale yellowish. Dorsal side bluish-grey dusted, abdominal tergites with whitish apices. Wings grey. Length (without wings) 1.75-2.0 mm.

Close to *L. dolichoptera* Richards but differing as follows: facial knob longer and narrower, face divided by a more acute distinct keel. Antenna with arista rather shorter, just less than twice as long as antenna. Four or five pairs of short stout interfrontal bristles; outside the anterior pairs are 3-4 small bristles forming a second row. Divergent bristles behind ocellars considerably weaker. Dorsocentral and acrostichal bristles shorter, central rows of latter less widely spaced. ♂ mid tibia with comb-like bristles more concentrated toward apex. Wings (figs. 9, 10) with R_{2+3} somewhat less sinuous, bristle on humeral cross-vein weaker and nearer costa. Male geni-

talia (figs. 11a, 11b) even larger and more elongate, anal split in dry specimens normally hidden by collapsed sides of the ninth tergite (not held apart because cerci are not broadly fused across the mid-line), lower part of ninth tergite with a number of moderately long bristles, two or three of which are stout and point downwards; sternites projecting strongly as a spout-like structure, the centre of which bears short dense bristles, beneath the genitalia; other sternites with short bristles. Cerci smaller and more widely separated, genital forceps much stouter and less pointed, posterior gonapophyses not curved upwards. Female abdomen not essentially different.

Holotype male and allotype female: Chile, Santiago: El Tabo, on seaweed, 12.V.61 and 5♂ 4♀, same data, (G. Kuschel); Peru, N.W. Caneto; Lima, at sea level, 13.IX.54, 3♂ (E. I. Schlinger and E. S. Ross). The type will be deposited in the British Museum and some paratypes in my collection and that of the California Academy of Sciences. The species was sent to me by Father Kuschel who found it in some numbers on seaweed with *L. johnsoni* Spuler. It also occurred mixed with the previous species which may also have been captured on the coast.

In Duda's key to *Leptocera* subgenus *Limosina* (his *Scotophilella*) (1925:153) both *L. dolichoptera* and *L. phycophila* key to *L. longipennis* Duda (1925: 178, fig. 26) of Peru and Bolivia. Both differ from it as follows: three not two dorsocentral bristles, wings rather longer, veins paler, second costal sector fully twice as long as third (not distinctly less than twice as long), mid-tibia



EXPLANATION OF FIGURES

Fig. 11, *Leptocera phycophila* Richards: a, male genitalia from the right; b, male genitalia in true dorsal (apparent ventral) view.

with paired bristles at $\frac{3}{4}$, in ♂ tibia and femur with modified bristles, basitarsus with one enlarged bristle below, ♂ genitalia larger.

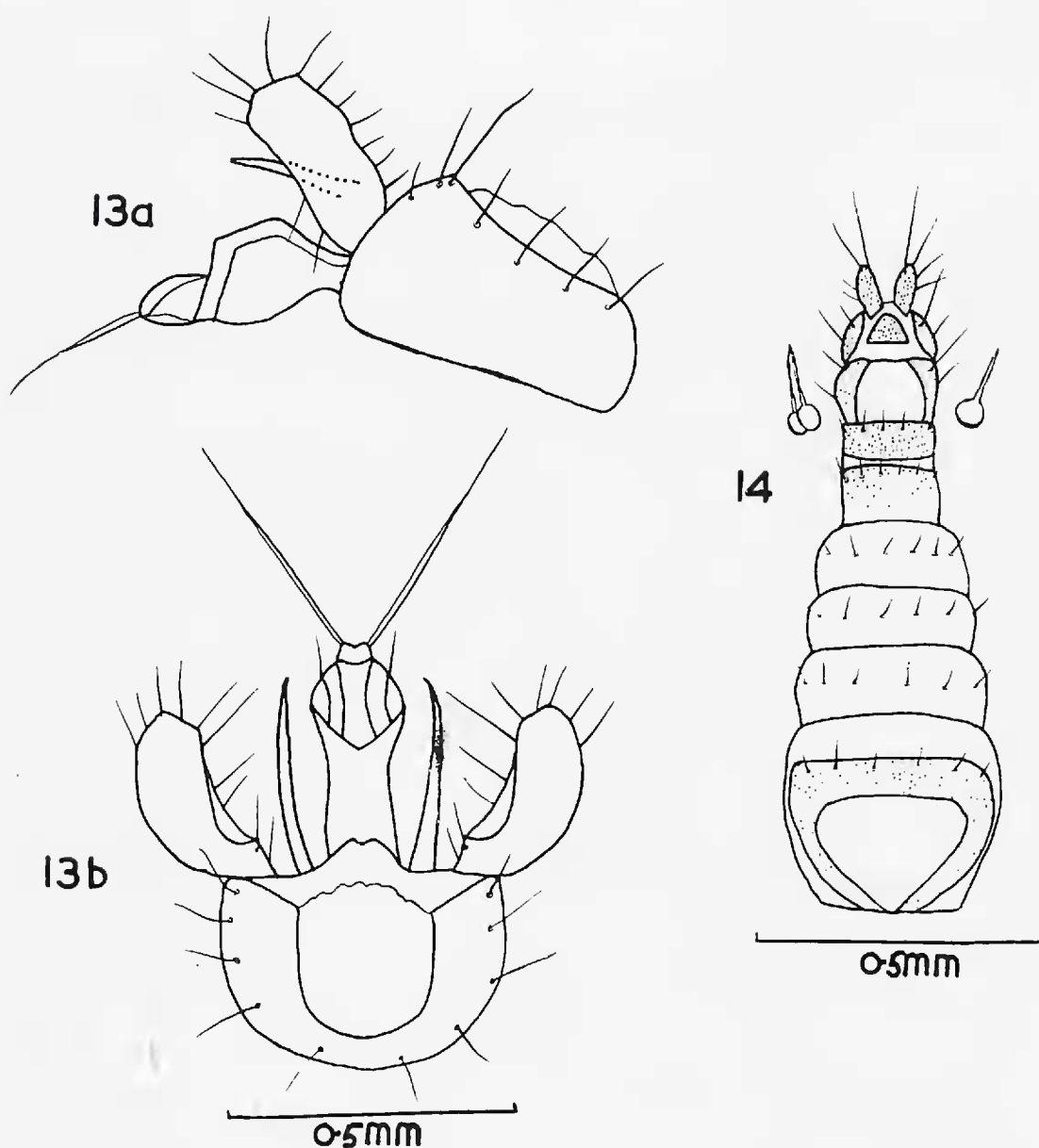
The three species together form a distinctive group known by the somewhat reduced eyes, very short arista and long wings with rather well-developed costal bristles. *L. empirica* (Hutton) (= *pectinifera* Villen.) does not seem to be very close in spite of Duda's remarks. The species seem to me to show rather a transition to the subgenus *Thoracochaeta* Duda in the antennae, eyes, head and thoracic bristles, and sexually dimorphic wing-length. However, the dorsocentrals are fewer and are not directed inwards as in that subgenus.

***Leptocera (Limosina) mollis* Richards, new species**

Male and female.—Black, very shining; frontal orbits rather broadly, frontal triangle, buccae, most of the dorsal division of the mesepisternum, pteropleuron and dorsal stripe of the sternopleuron, grey-dusted. Antennae, femoro-tibial joint, tarsi and some suffusion of all tibiae, pale yellow-brown. Halteres yellow-brown. Wings hyaline. Length about 1.2 mm.

Buccae with one bristle about half as long as the vibrissa, greatest width hardly more than one-quarter vertical diameter of the eye; upper part of face not at all projecting; antennae strongly divergent, first segment without inner, forwardly-directed bristle, third segment with rather long pale pubescence, especially in male, arista nearly four times as long as antennae, with long pubescence; only one outwardly directed orbital bristle, head bristles otherwise normal, adfrontal bristles in three small pairs. Thoracic bristles somewhat brownish; humeral bristle very short, one posterior pair of dorso-centrals and one inconspicuous more anterior pair just behind suture, acrostichals somewhat widely spaced, with about six rows between dorsocentrals; scutellum transverse, more than twice as broad as long, bristles relatively short, apical pair less than twice as long as the scutellum; two minute sternopleurals. Fore legs with no special modifications; mid femur with all bristles very short, mid tibia with a short antero-dorsal at $\frac{1}{4}$, a short dorsal at $\frac{4}{5}$, no mid-ventral, apico-ventral very short, tarsi with short setulae only, basitarsus long, more than half as long as tibia; hind legs normal, tibia without bristles, second tarsal segment not quite as long as first. Wings (fig. 12) with alula very narrow, costa without bristles, second sector hardly more than half as long as the third, darker than the rest of the costa, R_{2+3} gently bent onto the costa, R_{4+5} very feebly sinuate, just overpassed by the costa, ending well in front of wing-tip, distance between the cross-veins just longer than first sector of R_{4+5} , cell of moderate breadth and length, M_{1+2} produced as a slightly curved fold to near the margin, M_{3+4} just visible beyond the cell for a very short distance, anal vein feeble, hardly sinuate. Abdomen difficult to study before maceration because partly desclerotised and crumpled; ♂ genitalia small, anal split circular, surrounded by short bristles only, lower parts with denser short bristles,

details concealed; ♀ with cerci rather prominent, each having one very long and about three short sinuous hairs. When macerated, the abdomen in both sexes is largely white and desclerotised, only tergite 6 and the genitalia in ♂, and segment 6 to some extent in ♀ being sclerotised. ♂ with sternite 5 visible as a light brown plate of which the posterior margin is shallowly emarginate and the surface bears a few short bristles; tergite 6 well-developed on the left side with very few bristles; genitalia (figs. 13a, 13b) with short but fairly numerous bristles below, genital forceps relatively short and broad, wider and incurved at apex, with short straight spike-like bristles, mostly pointing inwards, posterior gonapophyses fine, almost hair-like; curved a little downwards; aedeagus in dorsal view with a Y-shaped sclerite leading to a narrow projecting strut which ends in two very long diverging



EXPLANATION OF FIGURES

Fig. 13, *Leptocera mollis* Richards: a, male genitalia from the right; male genitalia in true dorsal (apparent ventral) view. Fig. 14, the same, female abdomen in dorsal view with spermathecae shown separately, more sclerotised parts stippled.

bristles; in side view with a small blunt projection beneath the narrow strut. ♀ (fig. 14) with sixth and more posterior plates feebly sclerotised, cerci each with 3 fairly long bristles, 2+1 spermathecae, oval with a long sclerotised stalk.

Holotype male and allotype female: HONDURAS: BRUS LAGOON, 25.IV.47, and 5♂ 27♀, same data (C. W. Cork).

This unusually distinct species should apparently be placed in the subgenus *Limosina* Macquart. In Duda's key to the species (= his *Scotophilella*) (1925:153), it runs to couplet 46, but although the second costal sector is shorter than the third, the alula is very narrow and the antennae are pale. Moreover one superior orbital bristle is absent. *L. piscina* Richards, 1938 which runs to the same couplet has the second and third costal sectors more nearly equal and the antennae and abdomen dark. The pale antennae and abdomen separate it from all the other species described since Duda's key was published. In Malloch's key to Costa Rican species (1914:9) it would run to *L. varicosta* Malloch but in that species the second costal sector seems to be much darker, there are two orbital bristles and the abdomen appears to be normal.

LEPTOCERA (LIMOSINA) DARWINI Richards, 1931

This species is widespread in western South America and is known from most others of the subgenus by having an additional minute bristle at the base of the scutellum. Chile, Valparaiso: 20 km north of Concon, 26.XI.50, ♀; Valdivia; 30 km south of Valdivia, 13.I.31, ♂; Cautin: 20 km. east of Temuco, 8.I.51, ♀; Bio-Bio: El Albanico, 31.XII.50, ♀; Nuble: 18-40 km east of San Carlos, 23-24.XII.50, 16♂ 14♀ (all coll. E. S. Ross and A. E. Michelbacher).

LEPTOCERA (COPROICA) VAGANS (Haliday, 1833)

This species is now cosmopolitan and widespread in South America. Chile, Coquimbo: coast road 70 mi south of Oralle, 13.XII.50, ♂♀ (Ross and Michelbacher).

LEPTOCERA (COPROICA) HIRTULA (Rondani, 1880)

This species is also cosmopolitan and known from North and South America. Mexico, Gulf of California: Monserrate Island, 13.VI.21, 27♂ 40♀ (E. P. Van Duzee).

LITERATURE CITED

DUDA, O.

- 1925. Die ausserenropäischen Arten der Gattung *Leptocera* Olivier = *Limosina* Macquart mit Berücksichtigung der europäischen Arten. Arch. Naturges., 90A Heft 11 (1924):5-215, 4 pls.
- 1933. Sphaeroceridae in Lindner, E "Die Fliegen," 57. Stuttgart.

MALLOCH, J. R.

1914. Costa Rican Diptera collected by Philip P. Calvert Ph.D. 1909-10. Trans. American Ent. Soc., 40:1-36, 1 plate.

RICHARDS, O. W.

1931. Sphaeroceridae (Borboridae) in Diptera of Patagonia and South Chile. 6(3):62-84, 1 plate, 2 figs. London: British Museum (Natural History).
1961. Diptera (Sphaeroceridae) from South Chile. Proc. R. Ent. Soc. London, (B) 30:57-68, 13 figs.

SPULER, A.

1925. Studies in North American Borboridae (Diptera). Canadian Ent., 57:99-104, 116-124, 1 plate.

BOOK REVIEW

THE SIPHONAPTERA OF JAPAN. By Kohei Sakaguti and E. W. Jameson, Jr. PACIFIC INSECTS MONOGRAPH 3: 1-169, figs. 1-66 May 20, 1962 \$3.25 For sale by Pacific Insects, Bishop Museum, Honolulu, Hawaii.

A MONOGRAPH OF THE SIPHONAPTERA OF JAPAN by Kohei Sakaguti, pp 1-255, figs. 1-356, maps 1-7, plates 1-42 1962 (Received May, 1963) Limited edition of 200 copies \$30.00 + \$1.50 freight. For sale by Nippon Printing and Publishing Co., Ltd., Osaka, Japan.

These two books comprise an exhaustive treatment of these medically important insects in Japan. Both publications should be in the library of anyone who is concerned with Siphonaptera, and they should be used simultaneously since they are closely interrelated and complement one another.

Pacific Insects Monograph 3 by Sakaguti and Jameson does not provide more than brief morphological notes for a few species. However, factors concerned with ecology, host relationships, geographic distribution and possible migration with resulting hybridization are frequently discussed in detail under each species. These authors also list specimens examined and the geographic locality and host of each collection. A substantial section of the book is devoted to theories of evolution of flea fauna and zoogeography. Fleas in Japan may be placed in three groups according to geographic occurrence. Two of these groups may be related to proposed north and south faunal routes from the Asiatic mainland.

A Monograph of the Siphonaptera of Japan by Sakaguti provides synonymic references to literature regarding occurrence in Japan for each taxonomic category. Detailed descriptions are given for each species. Plates of photomicrographs of fleas are of amazing clarity and depth of field. There is a chapter on the geographic distribution of fleas in Japan. Both publications have carefully prepared and detailed drawings—HAROLD E. STARK, Training Branch, Communicable Disease Center, Public Health Service, Department of Health, Education, and Welfare, Atlanta, Georgia 30333.